they seemed quite firm and fresh, they gave to analysis 6·50 grammes of absolute alcohol, and a corresponding quantity of sugar was destroyed; the other twenty-four were left in contact with the air, and had became soft, watery, and sweet. It is the active vitality of a living plant, which consists of materials very suitable for their consumption, which prevents its being attacked by these promoters of putrefaction and fermentation. Our pears, after burning their substance for a time without any new supply, become weak, and fall an easy prey to their persecutors. The moment the soil is free there is no want of seed. I need not reopen the old question and repeat that every breath of air is full of it. It is said that if you want a thoroughly good pasture, the best way is to fallow your ground and leave it for thirty years. During that time you will have over it a battle-royal for life. Every possible kind of seed will come to it from the four winds of heaven, and for a time it will be a wilderness of weeds; but soon the good old law begins to work, and the weak go to the wall, and the fallow bears a close sward of native British grasses. The same takes place in our pear, only what takes thirty years in a field is compressed into thirty hours, and probably before a much longer time has elapsed, its surface is enveloped in a luxuriant microscopic jungle of *Mucor stolonifer*. WYVILLE THOMSON

THE FINDING OF LIVINGSTONE

How I found Livingstone in Central Africa. By H. M. Stanley. (London: Sampson Low, Son, & Co.)

MR. STANLEY'S bold march from Zanzibar to the Tanganyika, and his perfect success in meeting with and relieving the greatest of our modern travellers precisely at the right moment, will ever form one of the happiest and most romantic pages in the story of African exploration.

Remembering the watchword of his mission, "Go and find Livingstone," and that this, not the discovery of new countries, was his great object, it seems almost invidious to notice that Mr. Stanley's journey must take a minor place among African travels of exploration, adding little to our knowledge of the exact geography of the continent. The path which he traversed is for the most part a frequented caravan route, running parallel to, and occasionally touching, the lines passed over and described by Burton, Speke, and Grant. Without the basis given by the labours of these explorers, Mr. Stanley's work would have had but small value, since he himself has not made a single observation of position or of elevation, and the compass-bearings contained in some parts of his book are not in any way checked for magnetic variation. Still, very considerable portions of Mr. Stanley's route pass through lands hitherto untrodden by Europeans; some parts even unvisited by Arabs, and of these he is undoubtedly the discoverer.

Three frequented caravan routes lead from the coast near Bagamoyo towards Unyamyembe, and of these Mr. Stanley chose the most northerly and direct, the others having been traversed by Burton, and Speke and Grant. In following this new line, Mr. Stanley has been able to mark out more clearly than the former travellers the separate basins of the Kingani and the Wami rivers of the coastland; and he points out the important fact that the latter might be navigated with ease by light-draught steamers for a distance of 200 miles inland from the port of Whinde at its mouth.

At the base of a spur of the Rubeho mountains, the edge of the high plateau of Eastern Africa, the unexpected scene of a walled town presented itself. This was Simbamwenni, the capital of Useguhha, and the recently-built stronghold of an usurper, "another Theodore on a small scale"; "the houses in the town are eminently African; the fortifications are on an Arabic-Persic model; well-built towers of stone guard each corner; four gates are facing each cardinal point, and, set half-way between the several towers, permit ingress and egress to the inhabitants."

Beyond the mountains which face the coastland, Mr. Stanley's route converged in the dry region of Ugogo to that of Burton and Speke, and hence to Unyanyembe he passed over their track. Arrived at Tabora in Unyanyembe (the name Kazeh, applied to this capital by Burton, appears to be now unknown), Mr. Stanley found the whole country to westward overrun by the gangs of Mirambo, the turbulent chief of Ugoweh, a place some 60 miles north-west of Tabora. This chief sternly refused passage to the Arab traders unless they would aid him in a warfare he was about to wage against the Sultan of the Wanyamuezi in Unyanyembe. After taking part in an ill-directed and unsuccessful attempt to dislodge the obstructive Mirambo, Stanley determined to strike out for himself a new path outside the disturbed region. In carrying out this resolve he led the way, in a semicircular track of more than 200 miles, through the forest countries of Utakama, Ukonongo, and Ukawendi, first south, then west and northward to where he again fell in with the ordinary trade route. The whole of the geography of this detour is new and interesting, and it forms the chief portion of the discoveries which are particularly Mr. Stanley's own.

The path chosen lay round the southern tributaries of the Malagarazi river, the largest known tributary of the Tanganyika, and along the water-parting between this basin and that of the Rungwa river farther south, which Mr. Stanley affirms to be also an influent of the lake, flowing through the marshy plain called Rikwa (the Rukwa lagoon of Burton and Speke). The direction of flow of the Rungwa is a most important point, since it had been suggested as probable that the Tanganyika might have its outflow through this marshy country to the Lufiji river on the east coast. This theory appears now to have no foundation.

Passing over the arrival at Ujiji, and the most fortunate conclusion of Mr. Stanley's direct mission in meeting the great traveller there, the next perfectly new portion of this journey is that in which Livingstone and Stanley together explore the head of the Tanganyika.* "We found that the northern end of the lake was indented with seven broad bays." "The fourth bay (at the head of which was the delta of the Rusizi), was about three miles in depth, and penetrated half a mile farther inland than any other." "Soundings indicated 6 ft., and the same depth was kept to within a few hundred yards of the principal mouth of the Rusizi." "We ascended about half a mile, the current being very strong (from six to eight miles an hour), and about ten yards wide, and very shallow. The question, 'Was the Rusizi an effluent or an influent?' was settled for ever."

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* Mr. Stanley prefers the spelling Tan-gan-ika.

Much, if not the whole credit of this discovery, the most valuable geographical point of the journey, is due to Mr. Stanley, who suggested to Dr. Livingstone the desirability of its examination and the completeness of the circumnavigation of the head of the lake, along with the presence there of the most experienced of African travellers, leave no possible doubt remaining. The view first taken by Burton and Speke is amply confirmed, and the Tanganyika has certainly no outlet at its northern end.

When approaching Ujiji, Mr. Stanley heard a sound as of distant thunder in the west, and on asking his guides if it were thunder he was told that it was Kabogo, "a great mountain on the other side of Tanganika, full of deep holes into which the water rolls," "Many boats have been lost there; . . . The sound of the thundering surf which is said to roll into the caves of Kabogo was heard by us, therefore, at a distance of over one hundred miles away from them." This story, in which Mr. Stanley himself does not appear to place much confidence, has suggested a possible outlet of the Tanganyika to the Lualaba system by subterranean rivers through the mountains which enclose the lake on the west; but, besides the extreme improbability of such a phenomenon, it is to be remembered that Livingstone, in coming to Ujiji from the Cazembe's territory, must have passed close to these dreaded caves, and would not have gone by them without exploring, or at least hearing of their existence. It is not recorded that Mr. Stanley consulted Livingstone on this subject.

A remarkable fact, which, taken in connection with our knowledge of the insignificant drainage to the Tanganyika, seems to lend still further confirmation to the view first expressed by Burton that "the Tanganyika, situated like the Dead Sea, may maintain its level by the balance of supply and evaporation," is Mr. Stanley's observation of a clearly marked high-water line of the lake on the rocky slope of a promontory south of Ujiji. "This went to show that the Tanganyika, during the rainy season, rises about 3 ft. above its dry season level, and that during the latter season evaporation reduces it to its normal level." On the contrary supposition of the existence somewhere of a considerable outflowing river from Tanganyika, it is difficult to account for such a rise and fall in a lake of upwards of 10,000 square miles in extent.

View on Lake Tanganika.

The occasional descriptions of landscape throughout the volume are exceedingly graphic; for example, the descriptions of the forest scenes in the newly traversed region of Ukonongo (p. 322) or of the park-like and pastoral country of the coast slope (p. 167). With such an appreciation of the great landscape features of the changing belts of country through which he passed, it is to be regretted that the pictorial illustrations of Mr. Stanley's book should, with so few exceptions, be devoted to personal incident. As in many books of travel, so here, a ship, a wild boar, an elephant, or a house, form the subject of the majority of the pictures, the real scenery of the country being thrown in only as a background to these objects, drawings of which may be readily obtained at home.

It is also a matter of regret that the chief map accompanying the volume does but scant justice to the observations recorded in its pages; a much more detailed representation of the routes might have been given. We look in vain, for example, for the position of Mount Kibwe, which is frequently mentioned as one of the highest peaks of the mountains of Usagara, and which is the subject of perhaps the best illustration in the book. Again, "Mukondokua had been reached after three hours' march direct west from Misanza," but upon the map these places are shown relatively north-west and south-east; Imreras, a chief settlement in Ukawendi, and the objective point of Mr. Stanley's return-route from the lake with Livingstone is not to be found. The spellings of map and book are frequently at variance.

Two chapters of geographical and ethnological remarks may have some value to the student, but do not appear to add much to the exhaustive descriptions of Burton in his "Lake Regions."

Mr. Stanley gives very minute and apparently accurate descriptions of the various fishes of Tanganyika, and these are accompanied by a page of elaborate drawings. It is unfortunate, however, that some of the fishes to which the same names are applied by Burton and Stanley do not agree in their dimensions; thus, the *Mvoro*, according to Burton, is "a long bony variety, in shape like a large mackerel;" whilst Stanley's *Mvuro* is a "thick fleshy fish, 18 inches long and 15¼ inches round the body."

The excellent chapter on the organisation of the expedition, in which Mr. Stanley gives to future explorers the benefit of his anxious study of the requirements of the expedition at starting, the native currency, quantities of cloth, beads, and wire necessary for the journey, the hire of native porters, and such like, deserves the highest commendation; and the truth of his remark that "however stay-at-home people may regard the merits of his book, the greatest praise and the greatest thanks will be bestowed upon it by travellers who may succeed me in East Africa" is already on the point of being verified.

OUR BOOK SHELF

Nachträge zu der Schrift über Inschriften und Zeichen in lebenden Bäumen, sowie über Maserbildung. Von Prof. H. K. Göppert. (Breslau: E. Morgenstern.)

PROF. GÖPPERT published in 1869 in the *Jahrbuch des Schlesischen Forstvereins* some observations on the singular inscriptions and other marks found within the stems of living trees, to which the present pamphlet is an appendix. The original tract was illustrated by four lithographic plates, and in this publication we find two more, illustrating the mode in which injuries to the wood become entirely covered over and concealed by the subsequent formation of cambium and growth of bark. The visitor to the British Museum will observe some very curious instances of this phenomenon in the botanical department, which possess the additional interest that the exact period is known when the inscriptions were made, and consequently the age of the subsequent overgrowth can be determined.

Des Préparations Microscopiques Tirées du Regne Végétal, et des différents procédés à employer pour en assurer la conservation. Par Johannes Grönland, Maxime Cornu, et Gabriel Rivet. (Paris: F. Savy. London: Williams and Norgate.)

OF the 75 pages of which this book consists, only the last 25 properly relate to the subject which is indicated by the title; all the rest are occupied by descriptions, of a very detailed and apparently accurate kind, of apparatus and various accessories to microscopic work, such as all but the most inexperienced are necessarily perfectly familiar with. A classification and account of the various kinds of turntables fills 8 pages at the beginning; diamonds and scalpels are afterwards treated of, with the method of sharpening the latter. A simple plan of mounting needles for dissection, which consists in inserting their blunt ends into the pith cavity of pieces of fresh twigs cut of the proper lengths, and then allowed to dry, and consequently shrink tightly upon them, will, no doubt, be found useful. The handles, however, for crochet-needles which are sold at berlin-wool shops achieve the same end by a simple mechanical contrivance. The triangular needles, by the way, mentioned by the authors, are known in England as glovers' needles, and are kept by some instrument-makers. Microtomes are discussed very minutely: they are, no doubt, very useful; but excellent sections are habitually made by those who use no contrivance of any kind. Imbedding in stearine is recommended in the case of Rivet's most ingenious section cutter; but when this is done it will be found that, with a little practice, the instrument can be quite dispensed with. It will hardly be worth while, therefore, for any one who wishes seriously to work at vegetable histology to expend 28 fr. upon it. A good hint is to coat the object to be cut with a thick solution of gum-arabic, which is to be allowed to quite dry before putting it into the melted stearine. By this expedient, when the section is thrown into water as soon as cut, the stearine is said to detach itself, and gives no further trouble. The manufacture of a slide and covering glass (pronounced *sliade* and *coveur*) requires an explanation of 16 pages. It is, perhaps, a doubtful compliment to find only the mechanical side of English microscopy getting any recognition. It may possibly be all we deserve; still, no serious worker in England would waste his time in carrying out the directions given here for cutting, trimming, and polishing the edges of glass slips, which can be so easily purchased ready-made. Directions for making preservative solutions form the last chapter, and these are probably of some value. A medium prepared by adding 4 to 5 parts (by weight) of glacial acetic acid to 100 parts of distilled water, with which 2 parts of chloroform have been agitated for some time, is stated to preserve the endochrome of minute algæ without contraction, and to have the enormous merit, when vegetable tissues are worked with, of absorbing bubbles of air. Another liquid, composed of 75 parts of water saturated with camphor, an equal quantity of distilled water, and 1 part of glacial acetic acid, is recommended in the warmest terms for the preservation of fresh water algæ. A great deal still remains to be done in the methods of vegetable histology. No one in England has probably as yet tried perosmic acid for plant tissues; and staining, which has proved so important an aid to animal histologists, never enters into the minds of the authors, even to the extent of mentioning the familiar carmine; much less the solution employed by Hanstein for colouring the cell-wall, consisting of equal parts of rosaniline (magenta) and aniline-violet (mauve) dissolved in alcohol.[*] Schulz's process for demonstrating the "intercellular substance" characteristically concludes what the authors have to say. On the whole, any person wishing to practise the preparation of vegetable microscopic objects merely as a matter of business on a large scale, will find it useful to possess this book.

W. T. T. D.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Ipecacuanha Cultivation at Kew

I HAVE just received No. 158 of NATURE, containing Prof. Owen's letter "On the National Herbarium." In that letter Prof. Owen quotes several sentences relating to ipecacuanha cultivation in India from my last report for the official year ending March 31, 1872, on the Calcutta Botanical Garden, with the object of substantiating an insinuation of bad cultivation at Kew. He does not, however, quote the whole of what I wrote about ipecacuanha in the report referred to, and the result is, that a

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[*] Bot. Zeitung, 1868, p. 708.